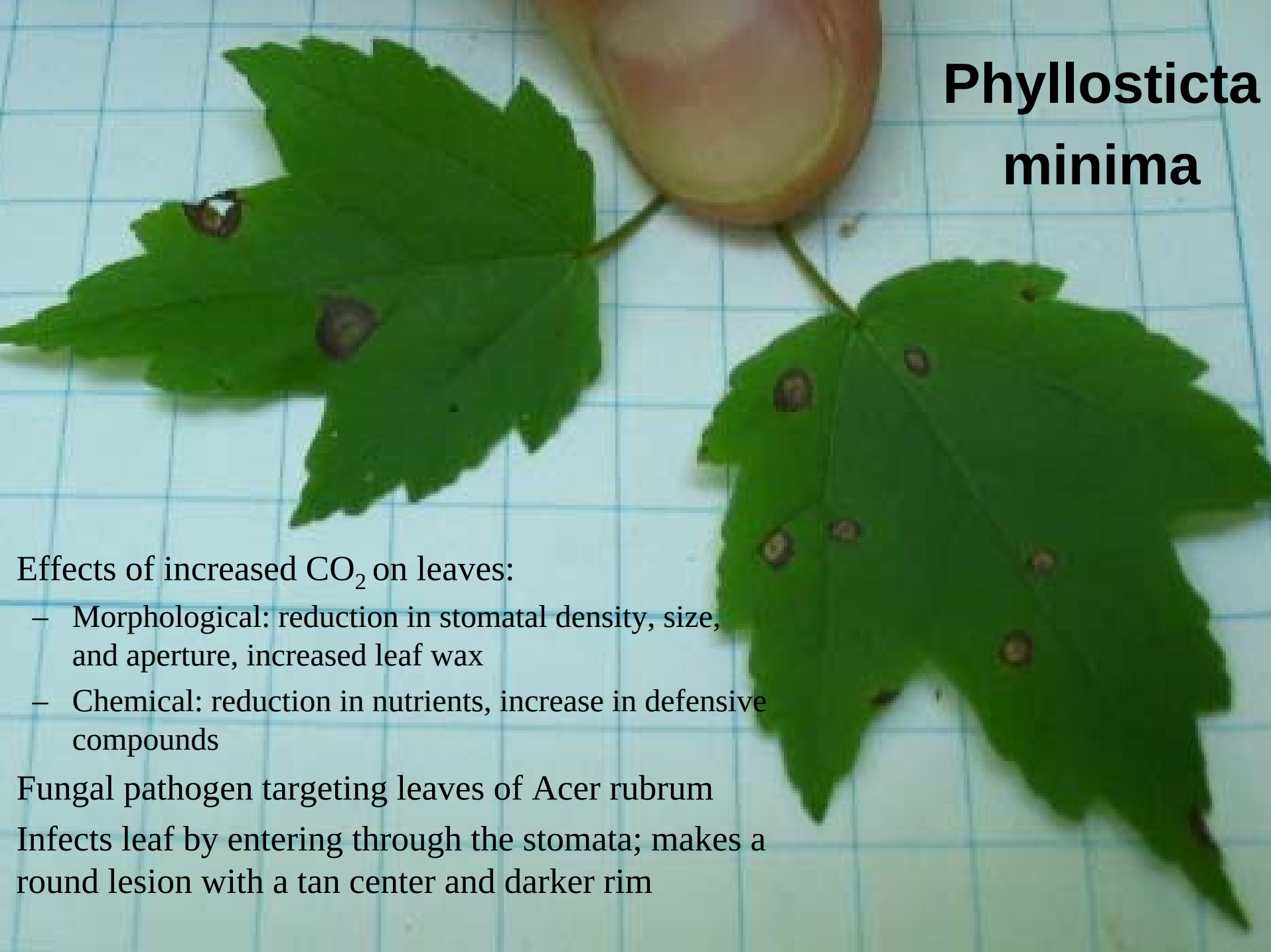
Foliar Pathogen Growth Response to Elevated CO_2

Phyllosticta minima



Effects of increased CO_2 on leaves:

- Morphological: reduction in stomatal density, size, and aperture, increased leaf wax
- Chemical: reduction in nutrients, increase in defensive compounds

Fungal pathogen targeting leaves of Acer rubrum

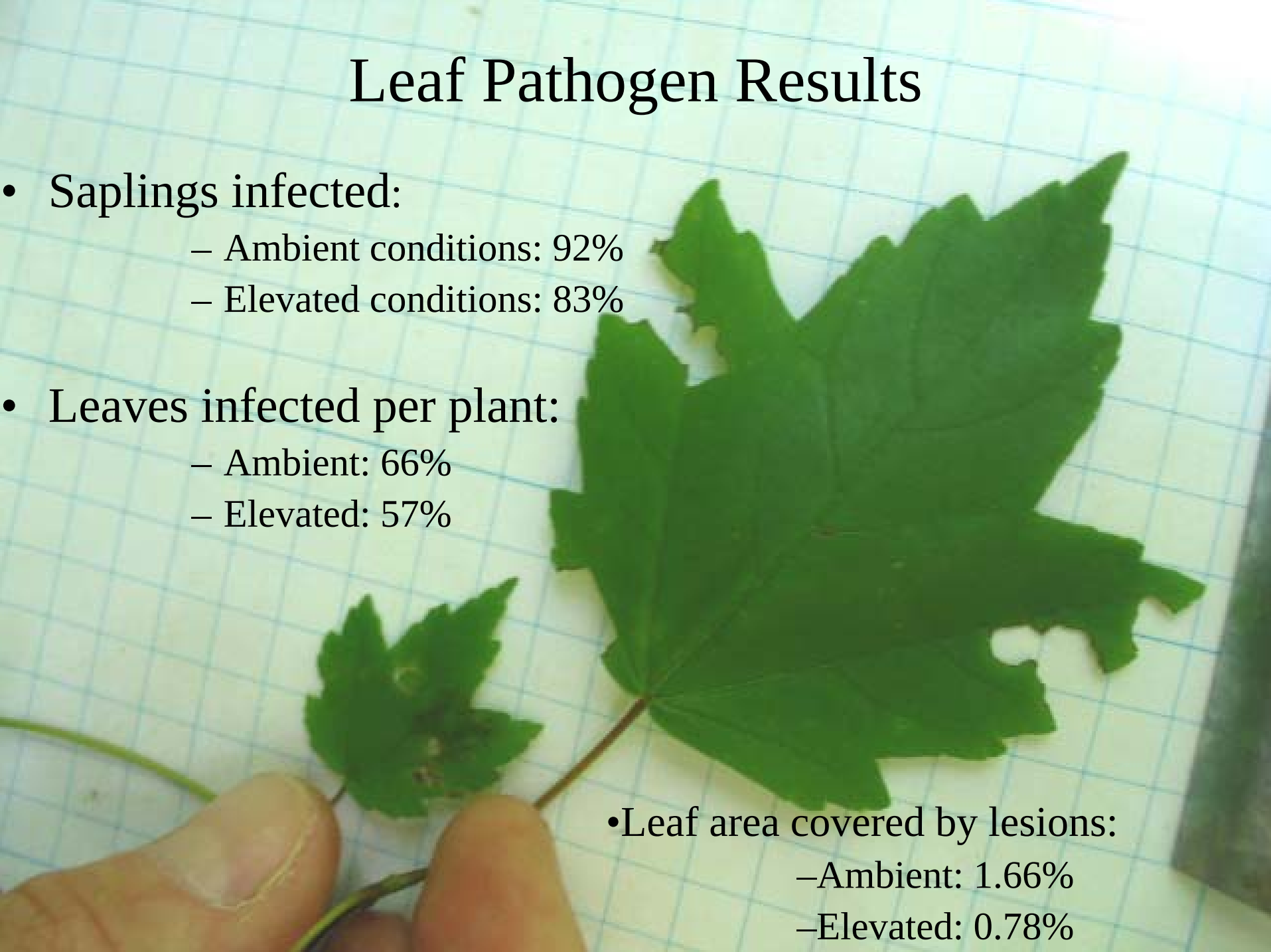
Infects leaf by entering through the stomata; makes a round lesion with a tan center and darker rim

Methods

- 8 Sub-plots within each ring (saplings)
- Pictures of each leaf on each A. rubrum sapling = 295 pictures!
- SCION Image program to analyze leaf area and lesion area

Leaf Pathogen Results

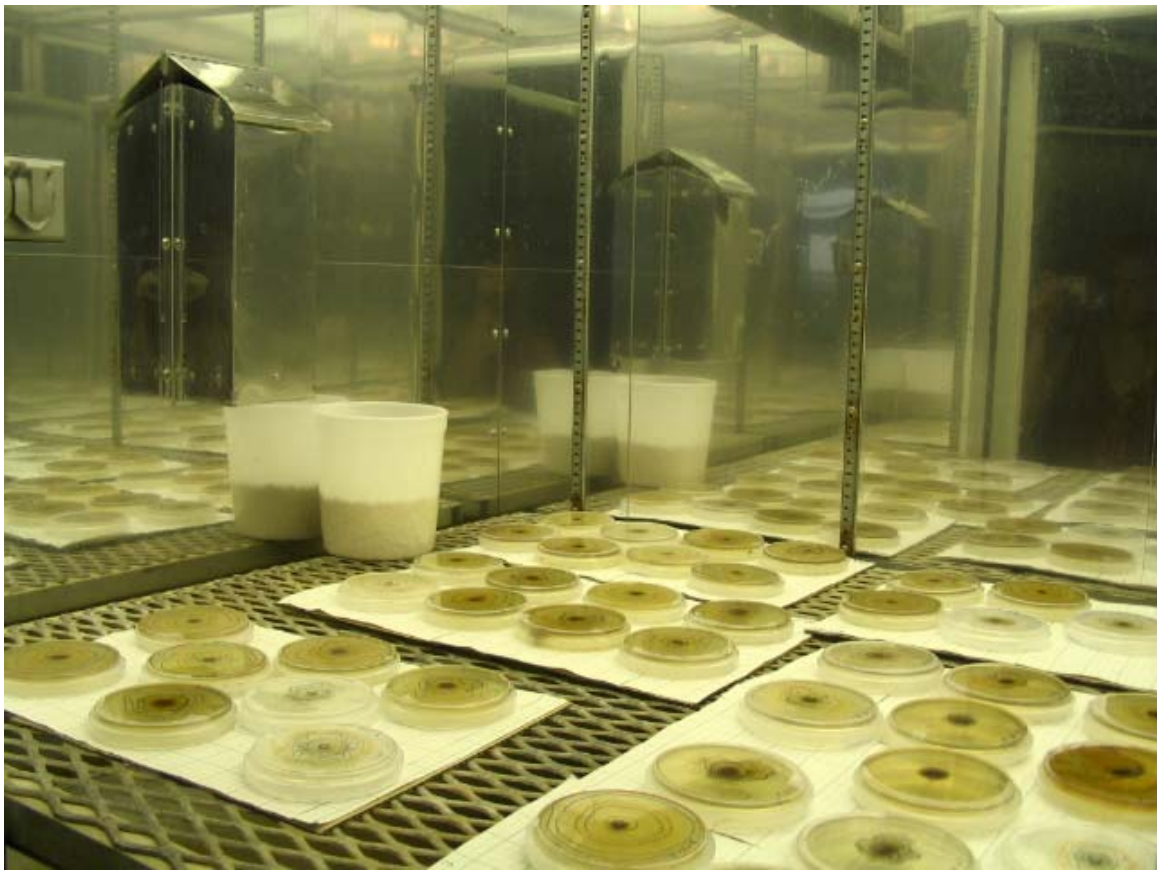
- Saplings infected:
  - Ambient conditions: 92%
  - Elevated conditions: 83%
- Leaves infected per plant:
  - Ambient: 66%
  - Elevated: 57%



- Leaf area covered by lesions:
  - Ambient: 1.66%
  - Elevated: 0.78%

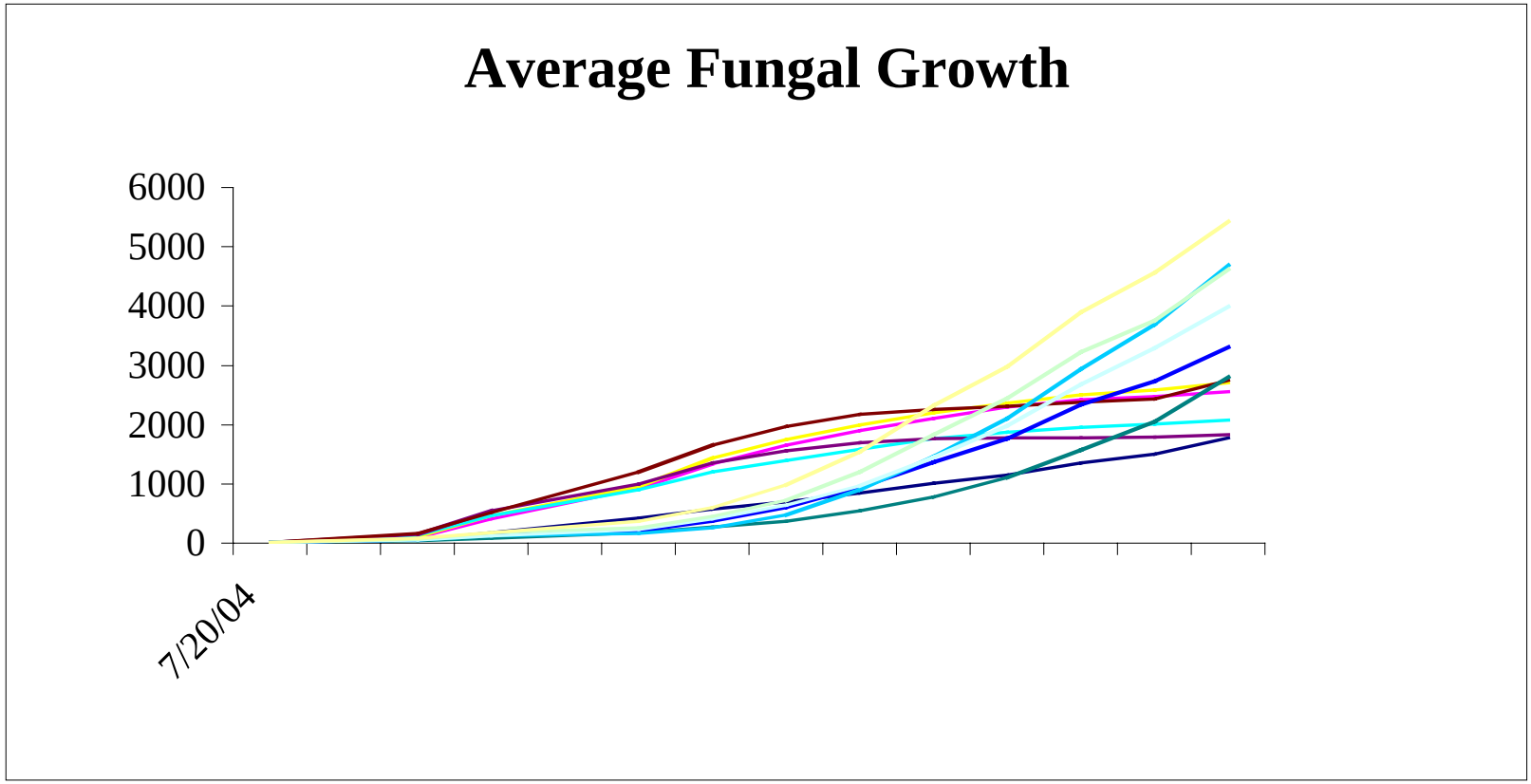
Isolating P. minima

Plants produce tannins in greater amounts at higher CO_2 levels and inhibit fungal growth

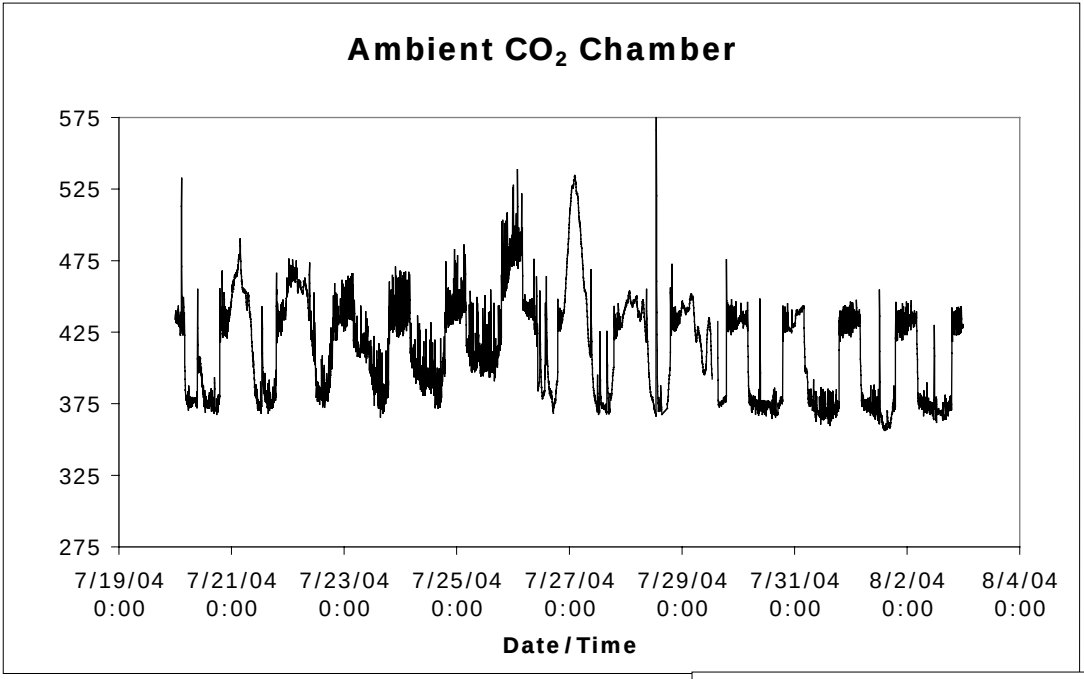


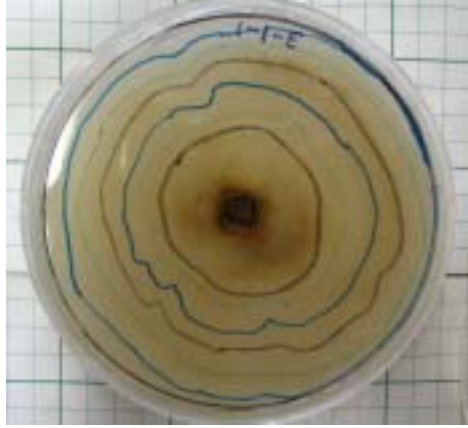
To see effects of tannic acid on fungal growth:

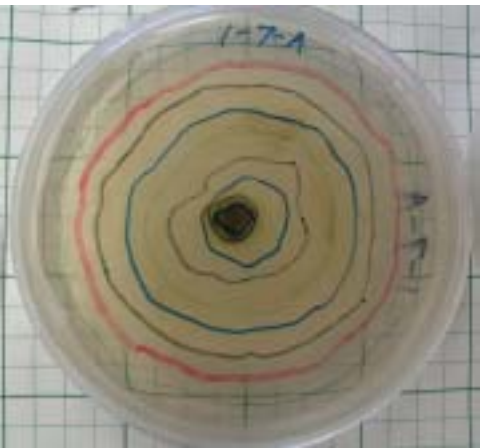
- P. minima grown on agar plates in presence of tannic acid
- Fungal cultures expected to have higher radial growth w/ elevated CO_2
- TA expected to interfere with fungal growth (but only at high conc?)

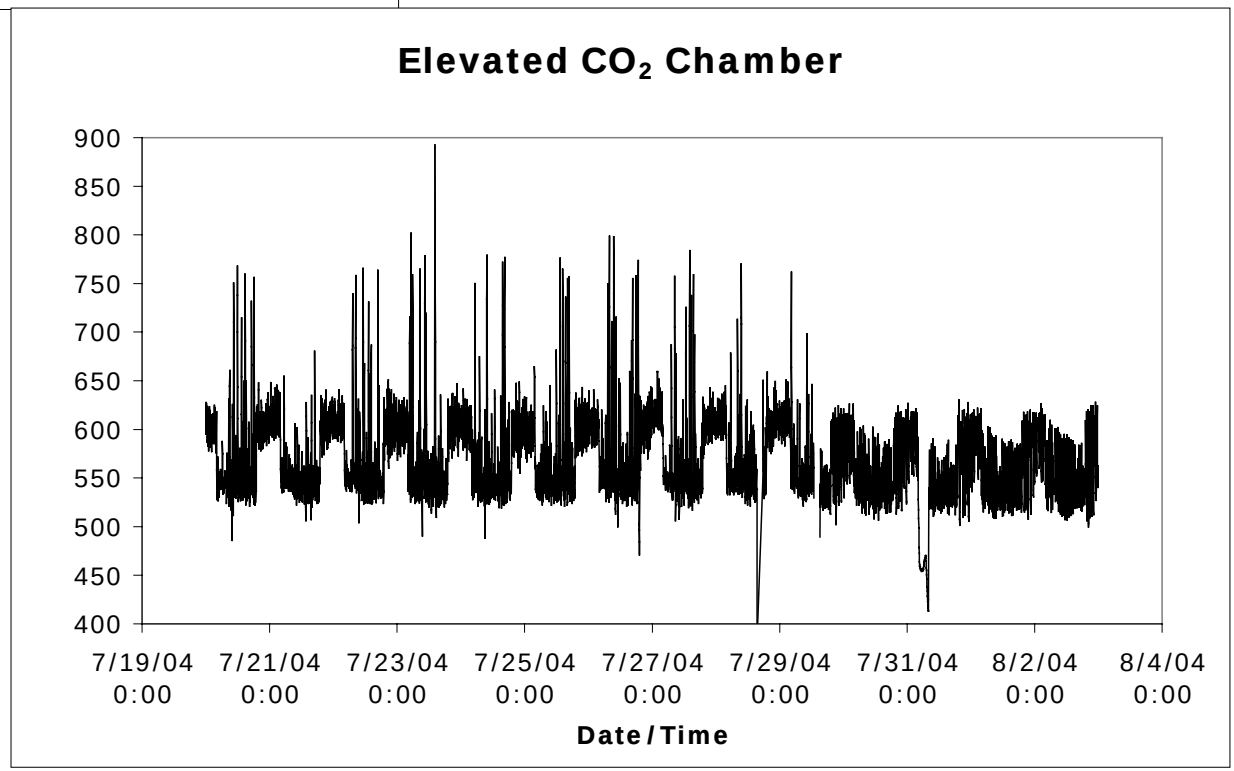


*no observations made 7/21 or 7/24

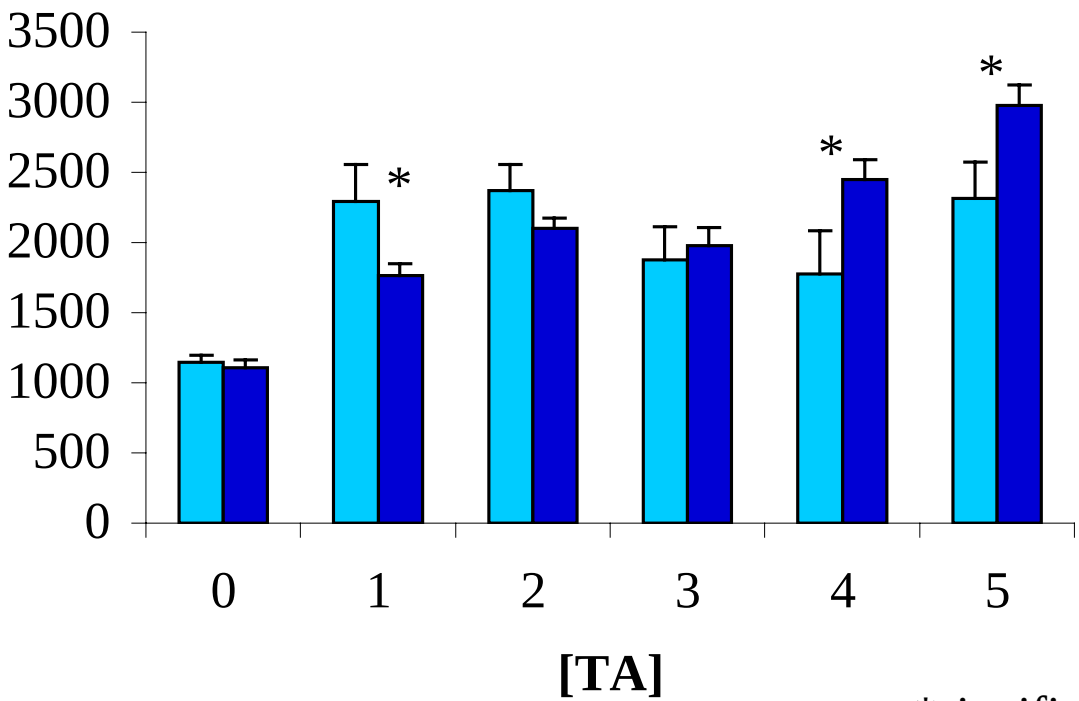

Ambient CO_2 Chamber
575
525
475
425
375
325
275
7/19/04 0:00
7/21/04 0:00
7/23/04 0:00
7/25/04 0:00
7/27/04 0:00
7/29/04 0:00
7/31/04 0:00
8/2/04 0:00
8/4/04 0:00
Date / Time






Elevated CO_2 Chamber
900
850
800
750
700
650
600
550
500
450
400
7/19/04 0:00
7/21/04 0:00
7/23/04 0:00
7/25/04 0:00
7/27/04 0:00
7/29/04 0:00
7/31/04 0:00
8/2/04 0:00
8/4/04 0:00
Date / Time

Three-Day Fungal Growth



*significant difference

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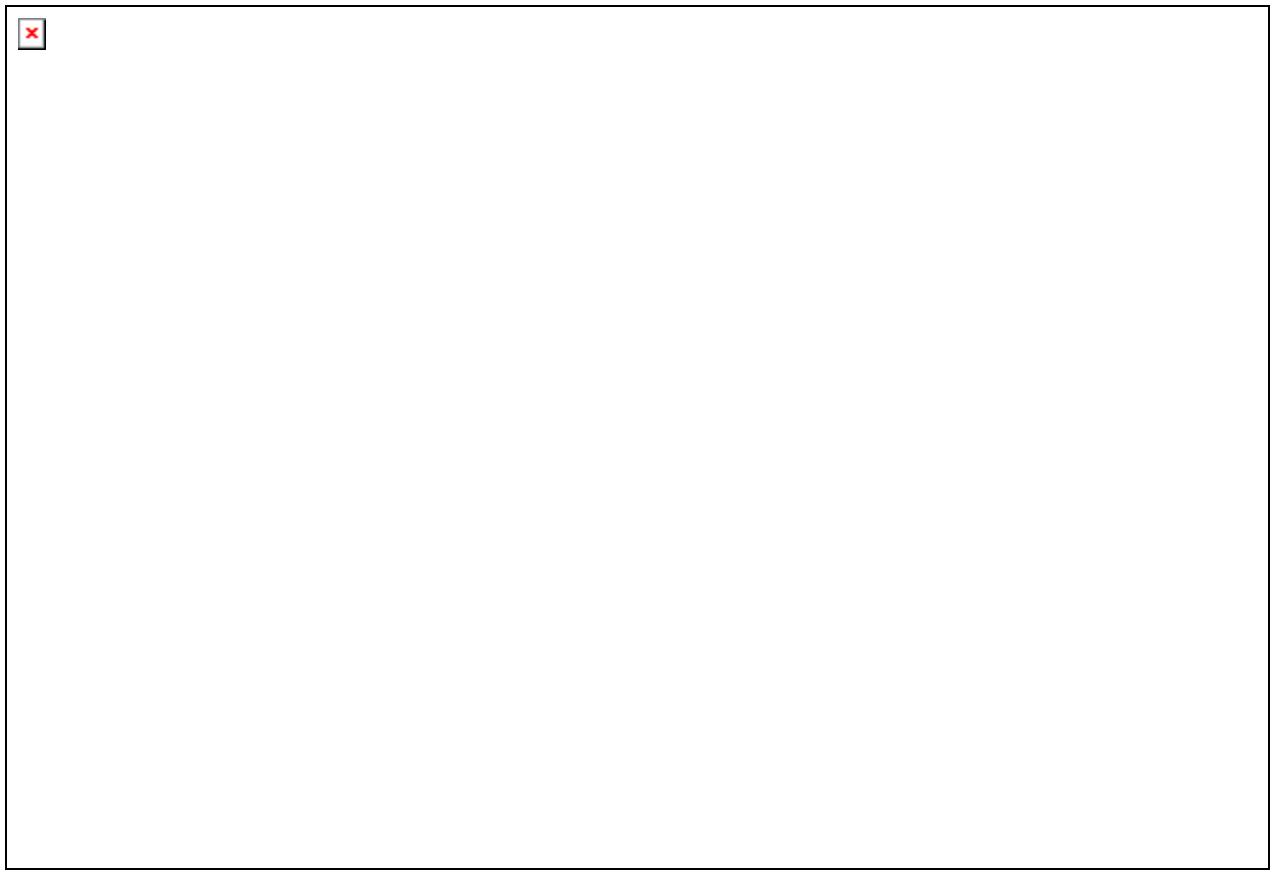
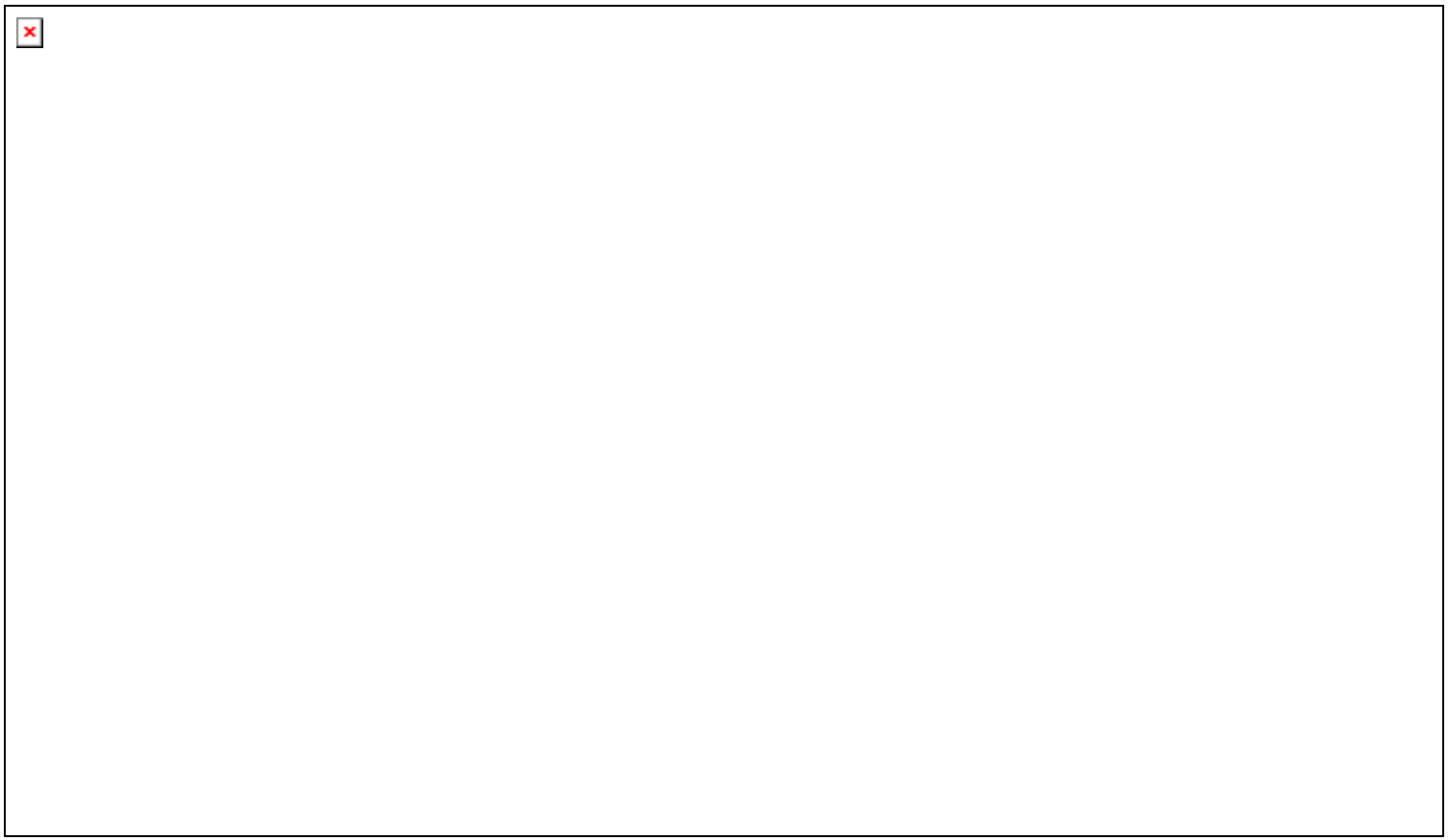
*significant difference





Conclusions

- Elevated CO_2 reduced infection of red maple saplings by P. minima at the FACE site
  - Reduced # leaves infected
  - Reduced # of lesions on infected leaves
- Although growth area of fungus on agar plates do not appear significantly different in ambient vs. elevated CO_2, trends indicate that a higher tannic acid concentration may inhibit growth over time in elevated CO_2

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